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The Phoridae (Diptera) of NE-Westphalia: a field study over five years

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Abstract: Contributing reliable data sets to support conservation efforts is currently the most important target of taxonomy and faunistics, yet the lack of statistically significant data makes unambiguous recommendations based on actual biodiversity mostly elusive. Especially the abundance distribution of large and ecologically diverse groups as a prerequisite to assess regional differences is in general not available. In this study a comprehensive faunistic record of Phoridae comprising about 290 species and more than 62000 specimens from a single location in NE-Westphalia caught over five years in a Malaise trap and occasionally by further methods is presented. The study will be distributed among two parts: I) Genera except *Megaselia*. II) *Megaselia*. This first part is devoted to 71 species of Phoridae except *Megaselia*: their sex ratio, abundance distribution, rarefaction and a thorough presentation of rare species and species new to the area of investigation including annotations concerning morphology, ecology, distribution and used literature. Where feasible a photo showing important characters has been added.

Key words: scuttle flies, fauna, Malaise trap, abundance distribution, new records, Germany

INTRODUCTION

The current public perception of biodiversity as a guideline to justify conservation activities is strongly biased towards "iconic" species, which in turn leads to a strong bias in the politically determined guidelines of funding, which in turn leads to a strong bias in scientific endeavours. Thus, of the about 100000 known insect species in Europe (Fauna Europaea, de Jong 2014) only about three dozens of large dragonflies, beetles and butterflies are listed in the Habitats Directive of Natura 2000, Annex II and a few more in Annex IV as sufficient to justify legal action (Habitats Directive of Natura 2000). On the other hand, for a reliable assessment of actual ecosystem structure complete inventories of large and diverse groups, at least from selected locations, are urgently needed.

The Phoridae are well suited as a model group to probe the quality of an ecosystem. They comprise large numbers of specimens and species and cover virtually every ecological niche we can conceive of (Disney 1994). The large number of specimens ensures that we can see more than just statistical outliers (singletons), which can't be attributed to the area investigated, but rather to, e.g. intermittent introduction by trade and tourism or insect migration. Whereas the large number of species from every part of the trophic spectrum allows for a statistically significant comparison of different ecosystem types.

For this study a Malaise trap has been operated for five years and the family of Phoridae has been separated and completely identified to species level. Occasionally other methods were used: a pitfall trap, sifting and a photoeclector. Due to a lack of a modern up-to-date European key Phoridae are still a quite difficult group. For this reason we add an annotated list of the less common species, some of which have not yet been recorded in the German fauna. The list comprises some distinctive characters, a photo where useful, comments on ecology and the known distribution in Germany and Europe.

All specimens were caught within a small patch of an old farm garden in NE-Westphalia, at the bottom of the northern part of the „Teutoburger Wald“, one of the northernmost forests of the German Mittelgebirge. The garden contains a rich flora of vegetables and fruits, decorative plants and weeds and is embedded in intensively used farm land interspersed by horticultural and semi-natural areas with hedgerows, minor woods and wet meadows unused for several decades. The investigated patch contains a compost heap and is surrounded by 150 year old oak trees, one of them completely hollow.

METHODS

A Malaise trap (construction after Townes (1972)) was operated for 5 years at N52.09, E8.38 and the specimens where caught and stored in 70% denatured ethanol. The collecting vessel was emptied and provided with fresh alcohol:

- every 7 days from May to September
- every 10 days in April and October
- every 14 days from January to March

Occasionally further capture methods where used: a pitfall trap in 2019, sifting of a close-by compost heap in 2020 and a photoeclector in 2021.

Representative samples of every recorded species are available on request from: Museum für Naturkunde, Sentruper Str. 285, 48161 Münster, Germany.

The specimens where determined with a Motic SMZ 171 stereo microscope with 20x eye pieces, which allows for a magnification up to 100x. Habitus photos were taken with a (planapochromatic) Zeiss Stemi 2000-C stereo microscope and a consumer SLR camera and some higher resolution pictures whith a Motic BA 310 compound microscope in a drop of glycerol with objectives from the inverse microscope.

Raw data can be downloaded in .csv format from: https://doi.org/10.5061/dryad.brv15dvfn. For the years 2017 and 2018 only the yearly abundance is available, whereas for 2019–2021 the detailed time intervals when the trap was emptied are given. From the same link an R file is available to create phenology diagrams in different forms, as raw plot based on the per year intervals or averaged per month. Also included is a complete set of 146 diagrams for those who don't have access to an R installation.

RESULTS

A total of 23954 specimens of Phoridae except *Megaselia* were partitioned among 71 species, 68 of which were found in the Malaise trap and 3 additional ones by sifting a compost heap immediately besides the Malaise trap: *Metopina perpusilla*, *Metopina pileata* and *Xenotriphleba dentistylata*. This corresponds to 50% of the known German fauna (Prescher & Weber 1999, Schumann 2002, Schumann 2004, Schumann 2009) plus 6 species not yet recorded in Germany. With the final target in mind, to make our results comparable to other studies of biodiversity, we first investigate into the abundance structure and sex ratio of our sample.

Missing Females?

To identify females is still a problem in almost all areas of entomologic taxonomy and this also holds for Phoridae. For some genera like *Conicera* and *Phora* a naming down to species level is not possible and for other genera it is at least by far more ambiguous than for males. Considering the different behaviour of the sexes leading to different sampling ratios, the female Phoridae were tentatively identified and counted, too. At the time this decision was made the females of the first 2 years of the study were already lost, so the analysis must be confined to the 16026 specimens of the last 3 years.

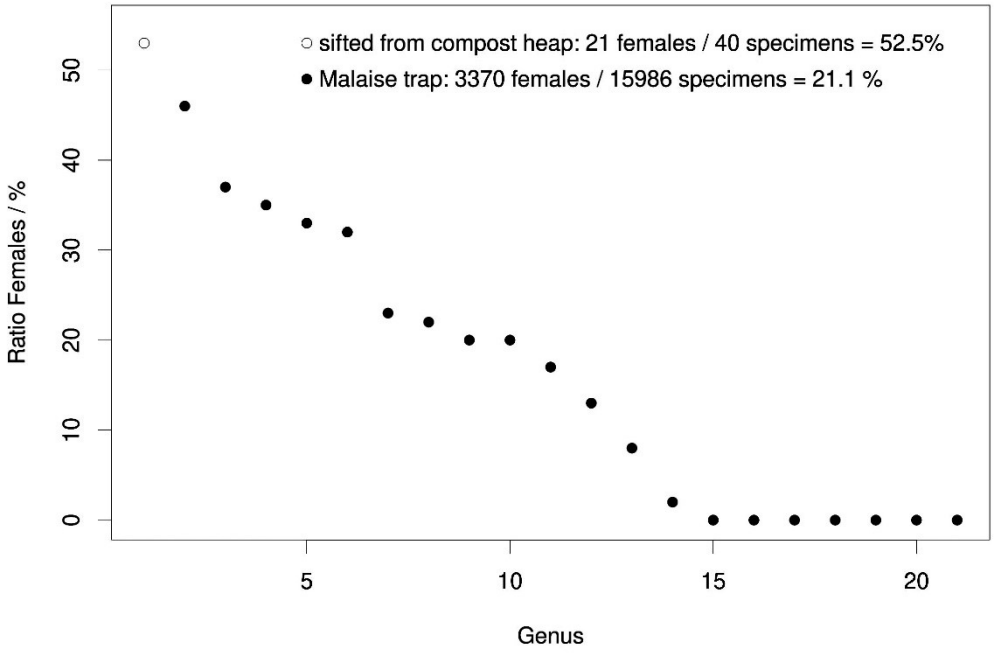

Fig. 1 Ratio of females by genus.

The surprising result is, that most of the overall caught specimens – and more so of the specimens from the Malaise trap – where males. The genus with most females (53%) is *Xenotriphleba* with the only European species *X. dentistylata*, a species which didn't show up in the Malaise trap but was sifted out from a compost heap besides the trap. The genus with the second largest female ratio (47%) is *Triphleba*, the most species rich one in our study (12 species). The females of all other genera are clearly underrepresented (Fig. 1), the overall odds of finding a female being 1:5.

One possible reason for this lack of females could be that males are the more migratory sex and females rather stay at or close to the place they became imago. But on the other hand for "a family of flies whose diversity of larval lifestyles is apparently without rival among insect families" (Disney 1994) such a stereotypic rule of behaviour obeyed by all species appears improbable.

We decided to exclude female specimen numbers from further statistic analysis.

Rarefaction

A commonly used device for comparison of different samples is a rarefaction curve in combination with the Chao satiation index (Gotelli & Colwell 2011). The curve (Fig. 2) estimates how many species we expect as a function of the number of sampled specimens, e.g. about 60 species in a sample of half the size as ours at 10000 specimens.

The Chao satiation index gives an estimated number of 86 (77) species occurring in the investigated place, compared to the 68 (65) species of males in our sample. This amounts to 84% (79%) of the local species pool. Given the additional 3 species recorded only in the female sex (*Metopina braueri*, *Metopina galeata* and *Triphleba luteifemorata*) which were excluded from our analysis, the number of species obtained in our study can be taken as fairly complete and justifies the analysis of a total abundance distribution.

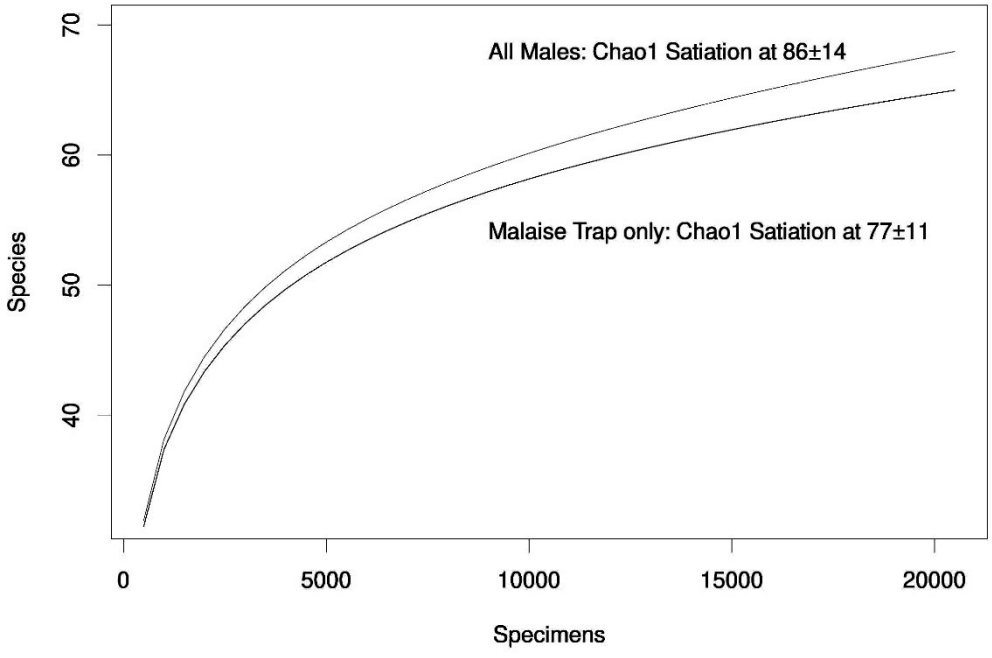

Fig. 2. Rarefaction of male specimens. Errors are one standard deviation.

Abundance distribution

The distribution of the number of specimens per species should be compared to known distributions from the literature, e.g. Fig 1.1 in Hubbell (2001), where 5 curves are given ranging from tree species in Amazonia to bats in Panama. All these curves show the known behaviour of a steep decline for common species, a flat range in the middle and another steep decline for the very rare species. In Fig. 3 we see a clear deviation for the rare species to the right, the steep decline being replaced by a horizontal line of singletons. This could indicate that we are farther away from species satiation as the Chao1 index suggests.

The steep decline for common species to the left is clearly present but far more extreme than in Hubbell's curves, where the most common species always covers about 10%. We get the surprising result that 80% of all specimens belong to only 3 species with *Diplonevra nitidula* being with 50% the most common one, and *Conicera floricola* (23%) and *Diplonevra pilosella* (7%) the other two.

A possible explanation for this extreme behaviour on the left side could be that we see a superposition of two distributions: a synanthropic and poor community of "weed species" and a rather species rich natural background community. Especially D. nitidula and D. pilosella seem to live on earthworms (Disney 1991b) and thus might be attached to freshly plowed fields (thanks for the hint to Ewa Durska), even if the uniform distribution of the observed phenology (see raw data, section "Methods" above) wouldn't be explained by a single plowing event.

Finally it can be seen that Hubbell's "Null Model", while ignoring ecological niche/life history data, can be an important and simple explanation of abundance distributions.

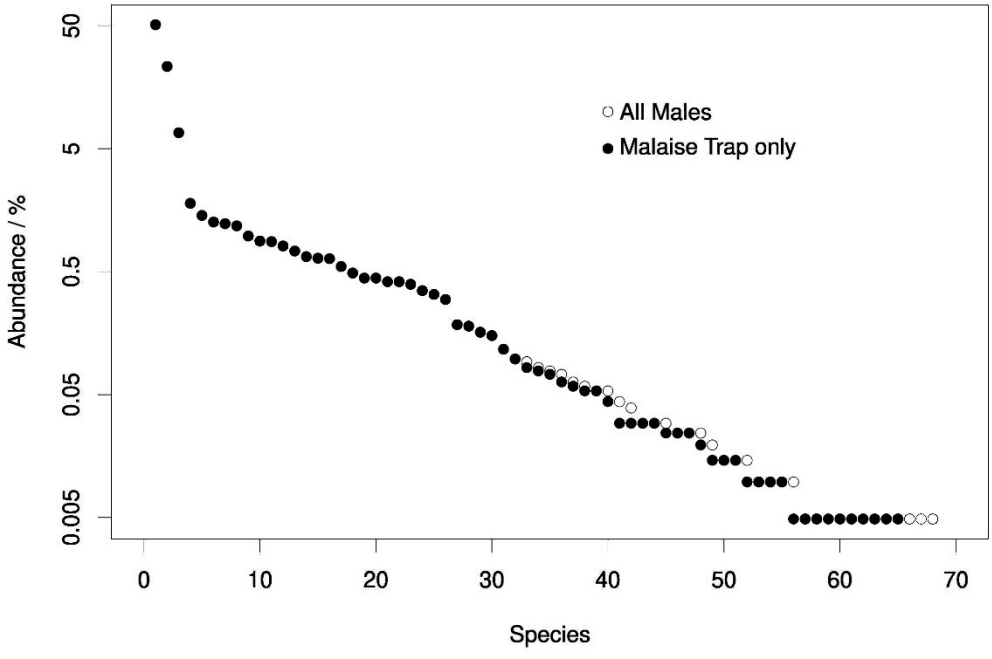

Fig. 3. Relative abundance of species.

Annotated List of Rare Species

Wherever possible we try to corroborate the identification of less common species by photos showing morphological details. In many cases the habitus is deemed sufficient, but where necessary we also added photos from a compound microscope at higher resolution. Scale bars are integer powers of a meter, either 1 cm, 1 mm, or 100 µm.

In the following list the citation of Fauna Europaea (Weber 2008) is abbreviated by FE.

Beckerina umbrimargo (Becker, 1901)

(Fig. 4)

Morphology. The habitus of this well characterized species is shown in Fig. 4.

Ecology. Imaginal activity ranges from April to June (Schmitz 1956), or even to August (Disney 1983). Seems to prefer humid habitats, development unknown (Prescher & Weber 2019).

Distribution. In Europe it is known in addition to the distribution given in FE (Austria, Belgium, Britain I., Czech Republic, Danish mainland, French mainland, Germany, Hungary, Ireland and Poland) from Sweden (Durska et al. 2010), the Netherlands (Schmitz 1941), Slovakia (Straka 2015) and Bulgaria (Langourov 2021). In Germany recently reported from Thuringia (Prescher & Bellstedt 2001), Hessia (Zaenker & Prescher 2012) and the Upper Rhine (Prescher & Weber 2019).

Fig. 4. *Beckerina umbrimargo,* habitus. Scale 1 mm.

Fig. 5. *Borophaga erythrocera*, habitus. Scale 1 mm.

Borophaga erythrocera (Meigen, 1830)

(Fig. 5)

Morphology. It is characterized by the enlarged and contrastingly red third antennal segment of the male. The female where the red colour of the antenna is much less developed, can be identified by the pair of bristles at the proximal half of the hind tibia.

Ecology. Imaginal activity in the late summer: August and September (Schmitz 1941). This corresponds to our results in Westphalia very well.

Distribution. The species is known from the eastern part of Germany: Berlin, Frankfurt/Oder (Schmitz 1941, as „Mitteldeutschland"), but we don't know recent records. It is new to the western part of Gemany. In Europe it is known from Austria, Belgium, Czech Republic, Germany, Hungary, Spanish mainland and The Netherlands (FE) and from Italy (Gori 1999).

Chaetopleurophora bohemanni (Becker, 1901)

(Fig. 6)

Morphology. It is characterized by the transverse combs at the dorsal face of the hind tibia in combination with 2 large apical spurs at the mid tibia both in the male and the female. A further diagnostic character is the shiny black frons.

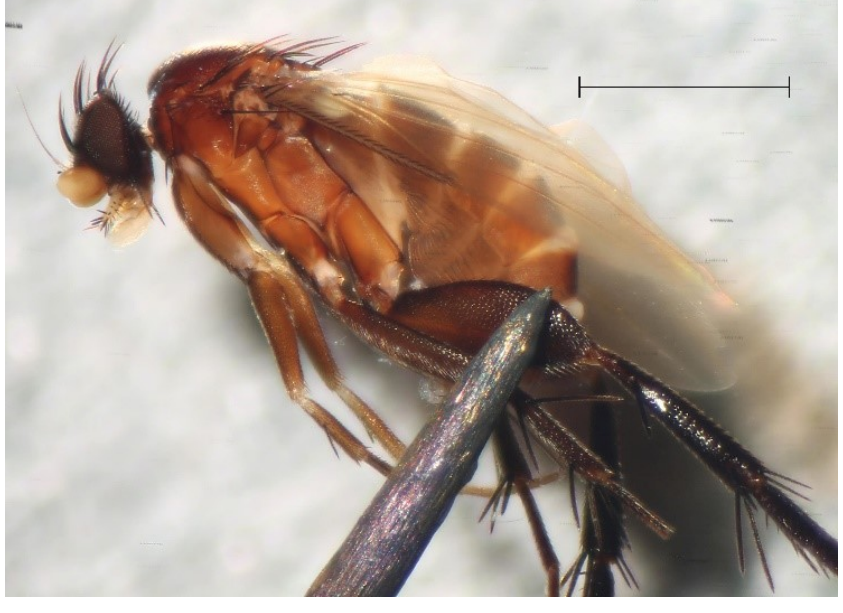

Fig. 6. *Chaetopleurophora bohemanni,* habitus. Scale 1 mm.

Ecology. As habitat moist woods are mentioned. Imaginal activity only in April and May. Development in snales, only one generation each year (Schmitz 1941, Disney 1994).

Distribution. In Germany this species is hitherto known only from the eastern parts (Schmitz 1941, as „Mitteldeutschland"), but there are no recent records. It is new to western Germany. In Europe it is known from Austria, Belgium, Britain I., Czech Republic, Danish mainland, Germany, Hungary, Poland, Slovakia and Sweden (FE) as well as from Croatia (Schmitz 1924) and from Bulgaria (Langourov 2021).

Chaetopleurophora pygidialis Schmitz, 1941

(Figs 7 & 8 – right)

Morphology. Very close to *bohemanni*, but there is only 1 large apical spur at the mid tibia both in the male and the female. Other than in *bohemanni* the frons is dull black. There are differences in the hypopygia of *bohemanni* and *pygidialis* as shown in Fig. 8.

Fig. 7. *Chaetopleurophora pygidialis,* habitus. Scale 1 mm.

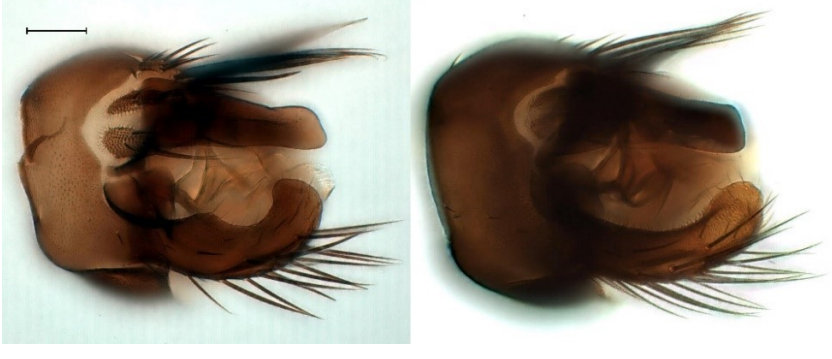

Fig. 8. Epandria of *Chaetopleurophora bohemanni* (left) and *Chaetopleurophora pygidialis* (right), dorsal view. Scale 100 µm.

Ecology. Imaginal activity in spring (Baumann 1976), development in snails (Schmitz 1941).

Distribution. This species has been described from The Netherlands by Schmitz (1941). In Germany it **is** known from one locality in the southwestern part: Germersheim at the upper Rhine (Baumann 1976). This is a new record for the northern part of Germany. Listed for Europe Germany, Hungary, Poland and The Netherlands (FE), and for Estonia and Romania (Schmitz 1941).

***Diplonevra freyi* (Schmitz, 1927)**
(Figs 9 & 10 right)

Morphology. It is very similar to *D. pilosella* Schmitz, 1927. In Schmitz (1949) the only difference given is the pilosity of the right side of the hypopygium. But this pilosity is very variable which can lead to misidentifications. A better character is the strong black apical bristles at the front of the hind coxa which are much longer than in *D. pilosella* (Fig. 10). The 3 specimens of *D. freyi* found here and more than 100 males found at another locality in northern Westfalia (Grundmann 2023) agree with this distinction, while all (more than 200) specimens of *D. pilosella* had much shorter bristles, without exceptions. This is a very useful new character for distinguishing both species.

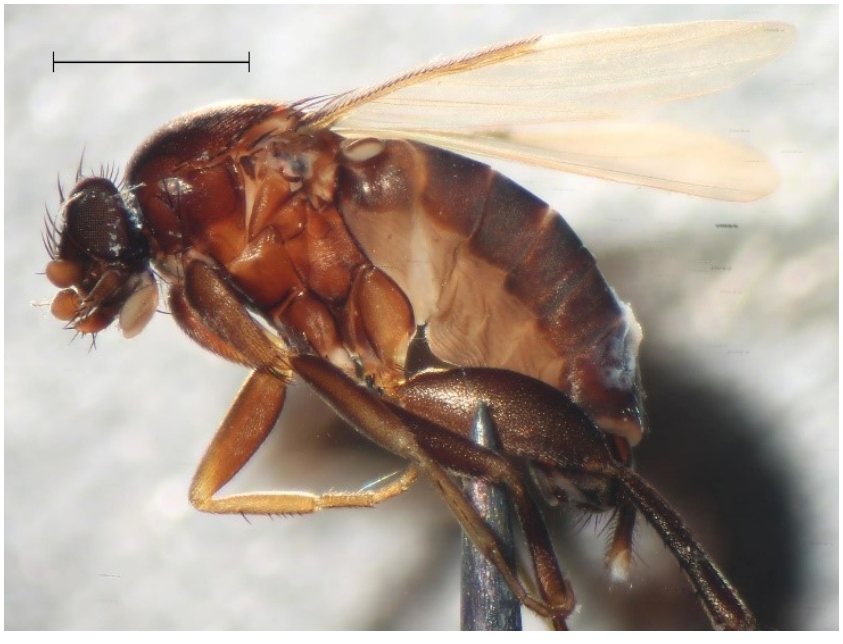

Fig. 9. *Diplonevra freyi*, habitus. Scale 1 mm.

Fig. 10. Right hind coxa and trochanter of *Diplonevra freyi* (left) and *D. pilosella* (right), anteriour view. Scale 100 µm.

Ecology. Nothing is known.

Distribution. Has been described from Finland by Schmitz (1927a). In Lindner (Schmitz 1949) further finds from Finland, Austria and two – then German – records from "Groß-Raum (Bez. Königsberg)", now in Russia and Zoppot near Gdansk, now in Poland as Sopot. The specification "Germany" in FE was based on (pers. comm. Gisela Weber) an entry "DDR" in (Disney, 1991), which most probably originated from a wrong positioning of the two records above. This means within the current borders of Germany *D. freyi* has not been recorded yet and this study gives the first "German" record. For Europe Austria, Finland, Germany and Sweden are listed (FE). It is also recorded from Greece (Disney 1991a).

***Diplonevra oldenbergi* (Schmitz, 1920)**

(Figs 11 & 12)

Morphology. It is closely related to the common *D. florescens* Turton, 1801 (formerly known as *florea* Fabricius, 1794) differing by the dark brown palps (Fig. 11) and the nearly straight first thin vein of the wing (Fig. 12).

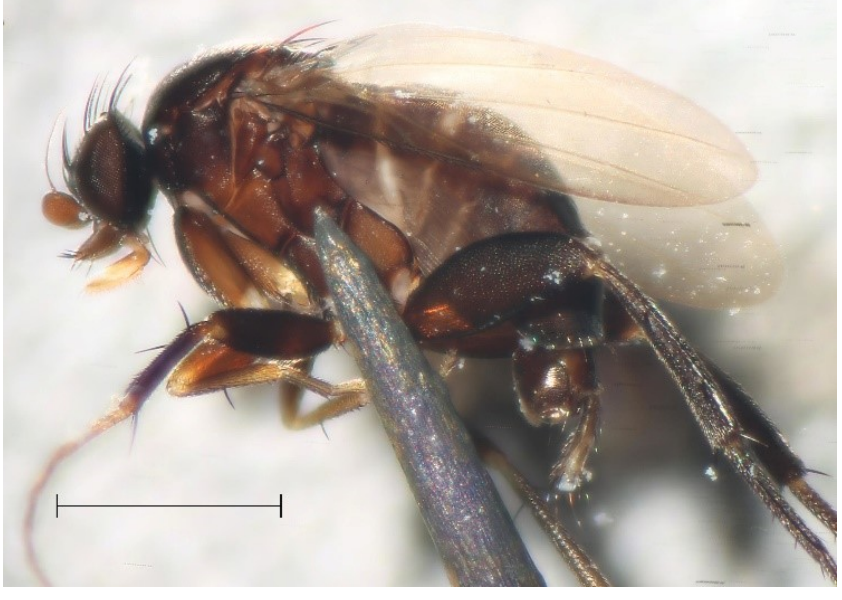

Fig. 11. *Diplonevra oldenbergi,* habitus. Scale 1 mm.

Ecology. Nearly nothing is known. In Denmark it has been reared from rotten plant material at the shore of a lake after high water (Schmitz 1949).

Distribution. Has been described by Schmitz (1920) from the eastern part of Germany: Berlin-Grunewald. This is the second German record after the description and the first record for the western part of Germany. In FE it is known from the Danish mainland, Finland and Germany. It is also recorded from Greece (Disney 1991a).

Fig. 12. *Diplonevra oldenbergi*, wing. Scale 1 mm.

***Gymnophora forresteri* Disney, 2017**

(Fig. 13)

Morphology. This species has been confused with *Gymnophora quartomollis* Schmitz, 1920 until Disney recognized it as different (Disney 2017). The two species are easier to distinguish in the female sex, e.g. by 8th tergite (Fig 13, top left) and the number long hairs on the 8th sternite (Fig. 13, bottom left), than in the male sex, where in *forresteri* the posterolateral lobes of the epandrium bear only 2-4 hairs (Fig. 13, right), opposed to about 7 hairs in *quartomollis*.

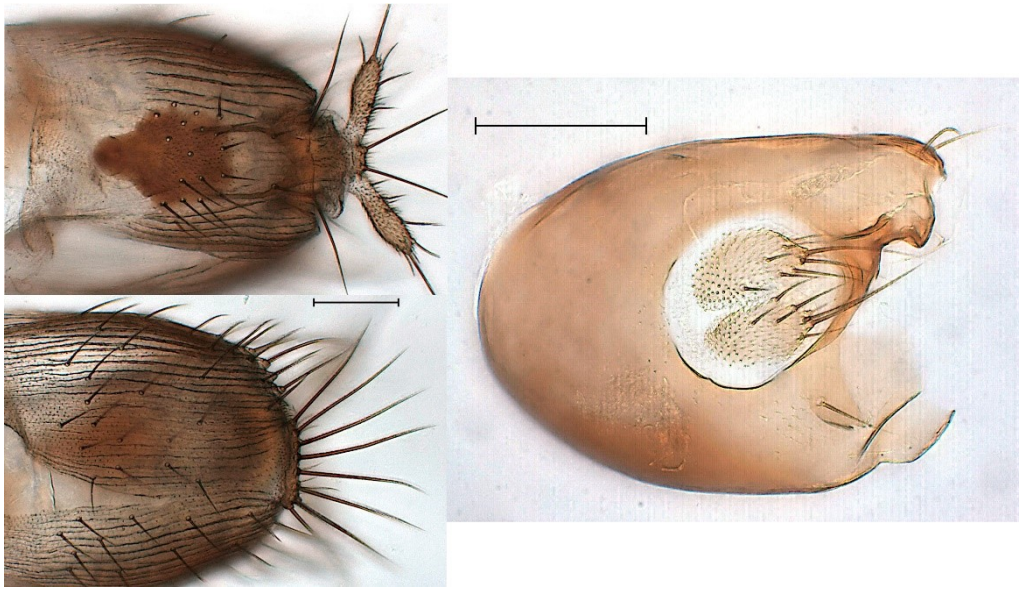

Fig. 13. Ovipositor, dorsal and ventral view (left) and epandrium, dorsal view (right) of *Gymnophora forresteri* (from www.spessart-fliegen.de). Scale 100 µm.

Ecology. Nothing is known.

Distribution. The type specimens are from England: Hampshire. This is the first officially published record for the German fauna albeit the photos are taken from specimens from southern Hessia (N50.31834, E9.68912), which are shown on www.spessart-fliegen.de. Taking into account that the species was described only 2017, together with the high similarity to *G. quartomollis*, it is to be expected to have a wider distribution.

Menozziola schmitzi (Menozzi, 1921)

Morphology. Very similar to *M. obscuripes* (see Appendix). The differences are shown in Gadau & Disney (1996).

Ecology. It is reported as a parasitoid of the ant *Crematogaster scutellaris* Olivier 1791 from Israel (Vonshak & Ionescu-Hirsch 2009).

Distribution. For Europe the Czech Republic, French mainland, Hungary, Italian mainland, Poland and Switzerland are listed in FE, further distributional records exist for Bulgaria (Langourov 2021) and Croatia (Schmitz 1928). Here it is reported as new for the German fauna.

Obscuriphora sheppardi Disney, 1986

(Fig. 14)

Morphology. Determination after Disney (1989) and Disney (1994). This minute species is characterized by the conical projection of the frons (Fig. 14), especially in the female sex (Fig. 14), and the very special hypopygium.

Fig. 14. *Obscuriphora sheppardi*, habitus of male (left) and female (right). Scale 1 mm.

Ecology. Nothing is known.

Distribution. The species has been described from England by Disney (1986). In Europe it is known in addition to the distribution in FE (Britain I., Poland) from the Czech Republic (Mocek et al. 2006, as new record for Central Europe) and Bulgaria (Langourov 2010, as new record for the Balkan Peninsula). This is the first one for the German fauna.

Phalacrotophora delageae Disney, 1979
(Fig. 15)

Morphology. Determination after Disney & Beuk (1997) and Disney (1979a). The male is very similar to *Ph. berolinensis* Schmitz, 1920. There are only little differences in some details of the hypopygium and the basal ventral hairs of the hind femora, these are somewhat longer than in *berolinensis*. The female is much easier to recognize by the structure and pilosity of the abdominal segment 8, the ovipositor (Fig. 15, right).

Ecology. Like the other species of this genus *P. delageae* is known to be a parasitoid of the pupae of the beetle family Coccinellidae. Disney & Beuk (1997) reared it from pupae of the genus *Adalia* Mulsant 1846, from Poland it is known to be an antagonist of *Harmonia axyridis* Pallas 1773 (Durska & Ceryngier 2010).

Distribution. In Europe it is known in addition to the distribution in FE (Czech Republic, French mainland, Hungary, Poland, The Netherlands) from England as new record by Irwin & Harvey (2014). The only German record is from Berlin by Triltsch (1999) but it has been seen for the first time in the western part of Germany.

Fig. 15. *Phalacratophora delageae*, habitus (left, scale 1 mm) and ovipositor (right, scale 100 µm).

Phora hamata Schmitz, 1927

Morphology. It differs from all other Central European species of the genus by the appendage of the right part of the epandrium, which has a deeply notched posterior margin (Disney 1983).

Ecology. Nothing known.

Distribution. This species has been described from Austria by Schmitz (1927b). In Europe it is known in addition to the distribution in FE (Austria, Britain I., Czech Republic, Germany, Hungary, Lithuania, Poland, Slovakia) from Bulgaria (Langourov 2004, as new for the Balkan region) and Finland (Kahanpää 2013, as new record for Finland). No recent records from Germany.

Plectanocnema nudipes (Becker, 1901)

Morphology. The only species of the genus *Plectanocnema* Schmitz, 1926 is easy to recognize by the irregular hair palisades of the hind tibia (Disney 1983).

Ecology. Imaginal activity from April to June (Disney 1983), development unknown (Schmitz 1956).

Distribution. In Europe it is known in addition to the distribution in FE (Austria, Britain I., Czech Republic, Germany, Hungary, Poland, Slovakia, Spanish mainland, Switzerland, The Netherlands), from Sweden (Durska et al. 2010) and from Bulgaria (Langourov 2021). There is one recent record from Germany: Prescher & Weber (1996) found it in the city of Cologne.

Pseudacteon brevicauda Schmitz, 1925

Morphology. Among the three European species *P. brevicauda* can be identified by the presence of a dorsal hair palisade at the basal half of the mid tibiae and by short bristles at the palps (Disney 1983, 2000).

Ecology. Like the other members of the genus *Pseudacteon* Coquillet, 1907 it is a parasitoid of ants (Donisthorpe 1927, O'Toole 1978, Disney 1979b). The host spectrum is restricted to the species *Myrmica rubra* Linnaeus 1758 and *M. scabrinodis* Nylander 1846. The flies are attracted only to disturbed ant colonies. They approach from behind and subsequently attack the ant in the gaster region (Witte et al. 2010). Donisthorpe (1927) recorded *Myrmica ruginodis* Nylander 1846 as host ant.

Distribution. In Europe it is known in addition to the distribution in (Weber 2008) (Azores Is., Britain I., French mainland, Germany, Spanish mainland, Switzerland) from Hungary (Lengyel 2009), Italy (Gori 2015) and from Portugal and Slovenia (Disney 2000). There is only one recent report from Germany (Feldmann 1992, from Hessia).

Puliciphora borinquenensis Wheeler, 1906

(Fig. 16)

Morphology. This species belongs to the *Megaselia*-like phorids without dorsal hair palisade at the hind tibia. It is distinguished from *Beckerina* Malloch, 1910 and *Woodiphora* Schmitz 1925 by an unforked radial vein 3 and a clear wing membrane (Disney 1983). At the moment there are three species known from Europe. Determination after Disney (1983, 1988) and Disney & Michailovskaya (2001).

Fig.16. *Puliciphora borinquenensis*, habitus. Scale 1 mm.

Ecology. The life history is documented by Miller (1984).

Distribution. This is a well-known cosmopolitan tramp species. For Europe Britain I., Canary Is. and Madeira Is. are listed. The British records are from Disney (1983) as pest in

laboratory insect cultures in Oxford and Mann (2007) as recent record in Oxford again. Here we mention this species as new for the German fauna and for the whole European mainland.

Was not caught in the Malaise trap, but by sifting out from a compost heap besides the trap.

Triphleba dudai (Schmitz, 1918)

Morphology. This species is characterized by the morphological details mentioned in the key of Schmitz (1943).

Ecology. Nothing is known about the habits and the development. Imaginal activity from June to October (Schmitz 1943).

Distribution. The species has been described from The Netherlands by (Schmitz 1918). For Europe Austria, Czech Republic, Danish mainland, Germany, Hungary, Poland, Slovakia, Switzerland and The Netherlands are listed (FE). Furthermore it is known from Bulgaria (Beshovski & Langourov 1997, Langourov 2021). No recent records from Germany.

Triphleba excisa (Lundbeck, 1921)

Morphology. Among the species with a radial fork and yellowish halteres *Triphleba excisa* is distinguished by a dense hair patch at the hind femur in the male. The female is characterized by the shape of the 7th abdominal sternite (Schmitz 1943, Disney 1983).

Ecology. Imaginal activity from October to December. Has been captured on carrion (Schmitz 1943, Cuttiford & Disney 2011). It is reported from Finland as inhabitant of burrows of little mammals (Hackman 1967).

Distribution. In Europe it is known in addition to the distribution in FE (Belgium, Britain I., Czech Republic, Danish mainland, Finland, French mainland, Germany, Poland, Sweden, Switzerland, The Netherlands) from Italy (Gori 2000, as new record for Italy). No recent records from Germany.

Triphleba minuta (Fabricius, 1787)

Morphology. This species belongs to the group with an incomplete radial fork. The male can be recognized by the shape and the rather long pubescense of the third antennal segment, the female by the elongated haustellum (Schmitz 1943, Disney 1983).

Ecology. Imaginal activity in September and October, development in fungi (Schmitz 1943). The life history is documented by Colyer (1952).

Distribution. In Europe it is known in addition to the distribution in FE (Britain I., Czech Republic, Danish mainland, Germany, Poland, Slovakia) from Sweden (Durska et al. 2010). No recent records from Germany.

Triphleba tumidula (Schmitz, 1918)

Morphology. Among the species with a radial fork and dark halteres *Triphleba tumidula* can be identified by shape of the appendages of the epandrium in the male. The female is characterized by the shape of the 7th abdominal sternite (Schmitz 1943).

Ecology. Imaginal activity in the early spring from February to April. Development in carrion (Schmitz 1943).

Distribution. In Europe it is known in addition to the distribution in FE (Austria, Belgium, Danish mainland, Germany, Poland, Slovakia, Switzerlands and The Netherlands are listed) from Bulgaria (Langourov 2004, as new for the Balkan region). Recent German records are reported only from the Upper Rhine (Baumann 1976).

Fig. 17. Abdomen of female *Woodiphora retroversa*, dorsal view. Scale 1 mm.

Woodiphora retroversa (Wood, 1908)

(Fig. 17)

Morphology. The only European species of the genus *Woodiphora* also belongs to the *Megaselia*-like phorids without dorsal hair palisade at the hind tibia. It is distinguished from *Beckerina* by the short costal cilia and an only slightly greyish wing membrane (Disney 1983). The female can be identified by the shape of the abdominal tergites (Fig. 17).

Ecology. This is a summer species, most abundant in July. Development in carrion (Schmitz 1956).

Distribution. In Europe it is known in addition to the distribution in FE (Britain I., Danish mainland, Hungary and The Netherlands) from Poland (Durska 2013). This is a new record for the German fauna.

Xenotriphleba dentistylata Buck, 1997

(Figs 18 & 19)

Morphology. This species is similar to the *Triphleba* species with unforked wing vein Rs, the species group formerly assigned to the genus *Citrago*. The male can easily be distinguished from the species of the genus *Triphleba* by the presence of two freely articulated surstyli. The female is characterized by the specialised tergit 6 (Buck 1997).

Ecology. All records from the end of June to the late September.

Was not caught in the Malaise trap, but by sifting out from a compost heap besides the trap.

Distribution. Has been described recently from the western part of central Germany: (Darmstadt) by Buck (1997). In Europe it is known in addition to the distribution in FE (Germany, Poland, Switzerland) from the Czech Republic (Mocek et al. 2006 and Mocek et al. 2008) and Hungary (Lengyel 2009). German records after the description only from Berlin (Werner 1997).

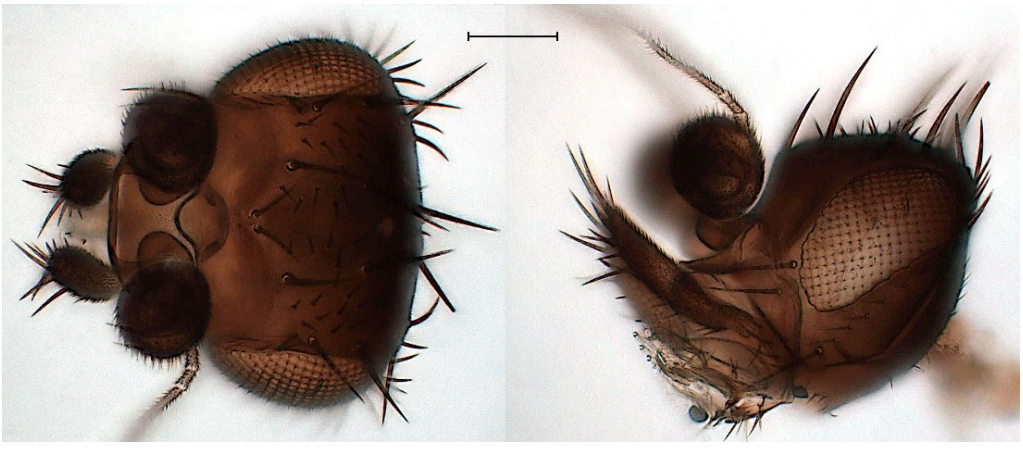

Fig. 18. *Xenotriphleba dentistylata*, head, dorsal and side view. Scale 100 µm.

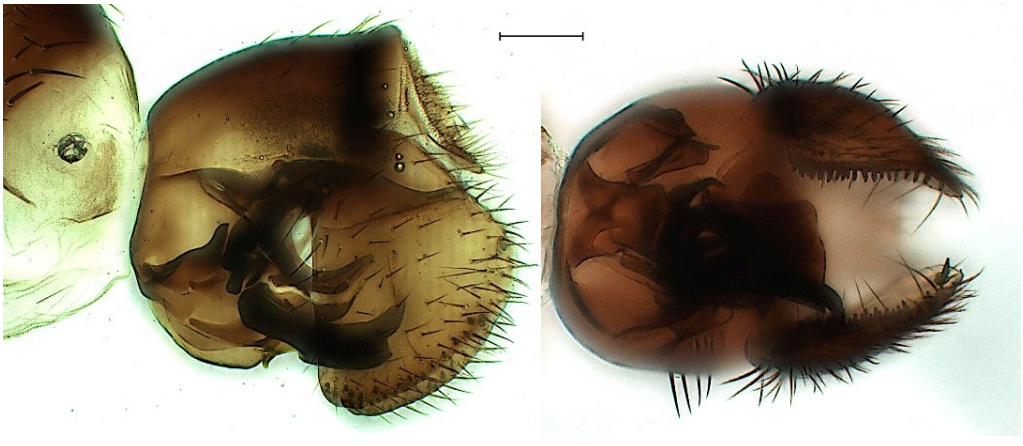

Fig. 19. *Xenotriphleba dentistylata*, hypopygium, side and ventral view. Scale 100 µm.

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STRESZCZENIE

[**Phoridae (Diptera) północno-wschodniej Westfalii: pięcioletnie badania terenowe. Część I. Rodzaje Phoridae z wyłączeniem rodzaju Megaselia Rondani**]

W pracy przedstawiono wyniki pięcioletnich badań, prowadzonych w północno-wschodniej Westfalii. Materiał zadrowatych (Phoridae) odławiano głównie za pomocą pułapek Malaise'a. Ogółem odłowiono 62812 okazów Phoridae. Przedstawione dane, które wchodzą w skład pierwszej z dwóch publikacji, dotyczą gatunków zadrowatych z wyłączeniem gatunków z rodzaju *Megaselia* Rondani. Wśród zebranych 23954 okazów stwierdzono 71 gatunków Phoridae. Autorzy porównali proporcje płci, rozkład liczebności i bogactwo gatunkowe (rarefaction: 86±14). Rozkład liczebności gatunków przedstawia stosunkowo ekstremalny wynik, ponieważ 80% wszystkich okazów należy do zaledwie trzech gatunków. W zebranym materiale stwierdzono sześć gatunków Phoridae nowych dla fauny Niemiec. Gatunki rzadkie i nowe dla regionu zostały omówione szczegółowo. Przy większości z nich dodano zdjęcia ułatwiające identyfikację.

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APPENDIX

Abundance List of Phoridae collected in NE-Westphalia during a field study over five years; the six species names marked in bold are new to the fauna of Germany.

No.	Species	2017	2018	2019		2020		2021		Sum
		♂♂	♂♂	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	
	Species obtained by Malaise trap									
1.	*Anevrina curvinervis* (Becker, 1901)	27	42	70	0	58	2	3	0	**202**
2.	*Anevrina thoracica* (Meigen, 1804)	103	25	97	25	134	34	10	5	**433**
3.	*Anevrina unispinosa* (Zetterstedt, 1860)	≈ 200	10	12	0	70	2	2	0	**296**
4.	*Anevrina urbana* (Meigen, 1830)	36	20	50	6	56	7	4	3	**182**
5.	*Beckerina umbrimargo* (Becker, 1901)	3	1	1	0	4	0	0	0	**9**
6.	*Borophaga agilis* (Meigen, 1830)	13	12	21	5	20	1	1	1	**74**
7.	*Borophaga erythrocera* (Meigen, 1830)	2	0	4	0	14	1	11	0	**32**
8.	*Borophaga femorata* (Meigen, 1830)	18	48	164	111	9	9	3	1	**363**
9	*Borophaga incrassata* (Meigen, 1830)	15	4	46	28	100	38	15	5	**251**
10.	*Borophaga subsultans* (Linnaeus, 1767)	0	6	8	5	1	1	0	0	**21**
11.	*Chaetopleurophora bohemanni* (Becker, 1901)	1	1	0	0	0	1	1	0	**4**
12.	*Chaetopleurophora erythronota* (Strobl, 1892)	76	3	19	16	31	8	2	1	**156**
12.	*Chaetopleurophora pygidialis* Schmitz, 1941	22	35	22	1	20	0	1	0	**101**
14.	*Chaetopleurophora spinosissima* (Strobl, 1892)	2	0	1	1	12	0	2	0	**18**
15.	*Conicera dauci* (Meigen, 1830)	≈ 200	5	2	0	51	7	2	0	**267**
16.	*Conicera floricola* Schmitz, 1938	≈ 2000	≈ 500	830	?	1278	?	182	?	**4790**
17.	*Conicera schnittmanni* Schmitz, 1926	?	?	?	?	1	?	0	?	**1**
18.	*Conicera similis* (Haliday, 1833)	2	0	3	?	7	?	0	?	**12**
19.	*Conicera tarsalis* Schmitz, 1920	0	3	0	?	3	?	0	?	**6**
20.	*Conicera tibialis* Schmitz, 1925	0	1	2	1	2	?	0	?	**6**
21.	*Conicera* ♀♀ indet.	0	0	0	5	0	14		9	**28**
22.	*Diplonevra abbreviata* (von Roser, 1840)	26	1	6	0	5	4	0	0	**42**
23.	*Diplonevra florescens* (Turton, 1801)	89	2	10	0	11	0	1	0	**113**
24.	*Diplonevra freyi* (Schmitz, 1927)	1	0	1	0	1	0	0	0	**3**
25.	*Diplonevra funebris* (Meigen, 1830)	3	0	2	0	0	0	0	0	**5**
26.	*Diplonevra glabra* (Schmitz, 1927)	46	3	15	2	18	1	9	1	**95**
27.	*Diplonevra nitidula* (Meigen, 1830)	≈ 2000	1383	3480	846	3361	1152	242	139	**12596**
28.	*Diplonevra oldenbergi* (Schmitz, 1920)	0	0	1	0	0	0	0	0	**1**
29.	*Diplonevra pachycera* (Schmitz, 1918)	1	3	4	0	1	0	2	0	**11**
30.	*Diplonevra pilosella* (Schmitz, 1927)	≈ 200	94	551	183	460	161	76	38	**1763**
31.	*Dohrniphora cornuta* (Bigot, 1857)	2	0	3	0	28	0	0	0	**33**
32.	*Gymnophora arcuata* (Meigen, 1830)	11	7	23	8	17	4	3	0	**73**
33.	***Gymnophora forresteri* Disney, 2017**	0	0	1	0	1	0	0	0	**2**
34.	*Gymnophora integralis* Schmitz, 1920	0	0	0	0	1	0	0	0	**1**
35.	*Gymnoptera vitripennis* (Meigen, 1830)	0	1	0	0	1	0	0	0	**2**
36.	***Menozziola schmitzi* (Menozzi, 1921)**	0	0	1	0	0	0	0	0	**1**
37.	*Metopina braueri* (Strobl, 1880)	0	0	0	0	0	1	0	0	**1**
38.	*Metopina galeata* (Haliday, 1833)	0	0	0	2	0	0	0	0	**2**
39.	*Metopina heselhausi* Schmitz, 1914	1	0	1	0	1	0	0	0	**3**
40.	*Metopina oligoneura* (Mik, 1867)	3	1	1	1	0	0	1	0	**7**
41.	*Metopina pileata* Schmitz, 1936	0	0	5	3	0	0	1	0	**9**
42.	***Obscuriphora sheppardi* Disney, 1986**	0	0	5	1	0	0	0	0	**6**
43.	*Phalacrotophora berolinensis* Schmitz, 1920	1	0	3	0	2	2	0	0	**8**
44.	***Phalacrotophora delageae* Disney, 1979**	0	0	0	0	2	1	0	0	**3**
45.	*Phalacrotophora fasciata* (Fallén, 1823)	0	0	9	9	9	4	2	0	**33**
46.	*Phora atra* (Meigen, 1804)	115	20	99	?	10	?	8	?	**252**
47.	*Phora edentata* Schmitz, 1920	2	0	11	?	3	?	0	?	**16**
48.	*Phora hamata* Schmitz, 1927	1	14	58	?	12	?	0	?	**85**
49.	*Phora holosericea* Schmitz, 1920	25	13	31	?	11	?	1	?	**81**

No.	Species	2017	2018	2019		2020		2021		Sum
		♂♂	♂♂	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	
50.	*Phora tincta* Schmitz, 1920	2	25	1	?	56	?	1	?	**85**
51.	*Phora* ♀♀ indet.	0	0	0	83	0	52		5	**140**
52.	*Plectanocnema nudipes* (Becker, 1901)	0	0	1	0	0	0	0	0	**1**
53.	*Pseudacteon brevicauda* Schmitz, 1925	0	0	1	0	0	0	0	0	**1**
54.	*Pseudacteon formicarum* (Verrall, 1877)	56	2	14	1	3	1	16	0	**93**
55	*Spiniphora bergenstammii* (Mik, 1864)	26	0	6	2	5	2	0	0	**41**
56.	*Spiniphora dorsalis* (Becker, 1901)	8	1	3	0	1	1	0	0	**14**
57.	*Spiniphora maculata* (Meigen, 1830)	6	26	52	22	50	3	2	0	**161**
58.	*Triphleba aprilina* (Schmitz, 1918)	35	9	4	0	11	2	13	2	**76**
59.	*Triphleba autumnalis* (Becker, 1901)	0	0	1	0	0	0	1	0	**2**
60.	*Triphleba distinguenda* (Strobl, 1892)	95	3	44	1	38	14	2	0	**197**
61.	*Triphleba dudai* (Schmitz, 1918)	1	0	0	0	3	0	0	0	**4**
62.	*Triphleba excisa* (Lundbeck, 1921)	0	0	1	11	0	0	0	0	**12**
63.	*Triphleba lugubris* (Meigen, 1830)	0	0	8	0	3	0	0	0	**11**
64.	*Triphleba luteifemorata* (Wood, 1906)	0	0	0	0	0	1	0	0	**1**
65.	*Triphleba minuta* (Fabricius, 1787)	0	0	0	0	1	0	0	0	**1**
66.	*Triphleba nudipalpis* (Becker, 1901)	106	1	12	7	29	5	3	2	**165**
67.	*Triphleba papillata* (Wingate, 1906)	3	14	2	89	109	84	4	22	**327**
68.	*Triphleba trinervis* (Becker, 1901)	1	0	0	0	0	1	0	0	**2**
69.	*Triphleba tumidula* (Schmitz, 1918)	0	3	3	0	14	1	4	0	**25**
70.	***Woodiphora retroversa* (Wood, 1908)**	0	0	0	0	1	0	0	0	**1**
	Species from pitfall trap used in 2019									
71.	*Conicera* ♀♀ indet.	0	0	0	12	0	0	0	0	**12**
72.	*Diplonevra nitidula* (Meigen, 1830)	0	0	0	7	0	0	0	0	**7**
73.	*Diplonevra pilosella* (Schmitz, 1927)	0	0	0	2	0	0	0	0	**2**
74.	*Gymnophora arcuata* (Meigen, 1830)	0	0	0	1	0	0	0	0	**1**
75.	*Triphleba distinguenda* (Strobl, 1892)	0	0	0	8	0	0	0	0	**8**
76.	*Triphleba nudipalpis* (Becker, 1901)	0	0	0	11	0	0	0	0	11
77.	*Xenotriphleba dentistylata* Buck, 1997	0	0	0	1	0	0	0	0	**1**
	Species sifted from compost in 2020									
78.	*Diplonevra pilosella* (Schmitz, 1927)					1				**1**
79.	*Metopina perpusilla* (Six, 1878)					1				**1**
80.	*Metopina pileata* Schmitz, 1936					2				**2**
81.	*Pseudacteon formicarum* (Verrall, 1877)						1			**1**
82.	***Puliciphora borinquenensis* Wheeler, 1906**					1				**1**
83.	*Xenotriphleba dentistylata* Buck, 1997					19	20			**39**
No.	**Species**	**2017**	**2018**	**2019**		**2020**		**2021**		**Sum**
		♂♂	♂♂	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	
	Species obtained by photoeclector used in 2021									
84.	*Anevrina unispinosa* (Zetterstedt, 1860)								1	**1**
85.	*Borophaga incrassata* (Meigen, 1830)								1	**1**
86.	*Diplonevra pilosella* (Schmitz, 1927)							4	2	**6**
	Total	**5.586**	**2.342**	**5.826**	**1.510**	**6.174**	**1.643**	**635**	**238**	**23.954**